

# Role and Capabilities of the Federal Office for Radiation Protection in the response to the Po-210 incident in Hamburg in 2006

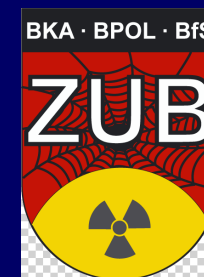


# The Federal Office for Radiation Protection

is a scientific and technical Federal Office

belongs to the Federal Ministry for the Environment, Nature Conservation and Reactor Safety (BMU).

works together with the Federal Criminal Police Office and the Federal Police for the defence against nuclear hazards.



**President  
Wolfram König**

**Administration**

**Safety in  
nuclear-  
technology**

**Safety of  
nuclear  
disposal**

**Radiation  
protection  
and health**

**Radiation  
protection and  
environment**

**Specialized Departments**

**connection**

**AG-NGA  
Defence against  
nuclear hazards**

# Capabilites of the Federal Office for Radiation Protection

- Detection of radioactive materials, radionuclide determination, the estimation of activity levels and contamination measurements.
- Evaluation of radioactive materials and criticality risks.
- Estimation of radiological consequences following a detonation/dispersion and radioactivity predictions.
- Advising policy-makers in all aspects of radioactivity (medical, protective measures, transport, public, etc.)

## Po-210

Physical half-life:	<b>138 Days</b>
Biological half-life:	<b>30 – 50 Days</b>
$\alpha$ -particle mfp (body):	<b>42 <math>\mu\text{m}</math></b>

## Uses

Together with Be as a neutron source  
(eg., as a trigger for a fission bomb)

Static eliminator (photocopiers, textiles)

RTG cell for spaceflight  
( 1g Po-210 produces 140 Watt)

## Uptake in the body

Inhalation (eg., smoking)

Ingestion with food

Open cuts

# Manufactured production

**A** Po-210 > 0 Bq/kg

**A** Pb-210 = 0 Bq/kg

## Manufacturing methods for POLONIUM-210

- Most of the world's Po-210 is produced in Russia in Chernobyl-type **RBMK** reactors;
- As far as we know, gram amounts are produced by Russia annually.
- According to a claim by Sergei Kiriyeenko, the head of Russia's state atomic energy agency, **RosAtom**, all of it goes to U.S. companies through a single authorized supplier.

# Consequences of a Po-210 INCORPORATION

(estimation of the magnitudes involved)

The smallest amounts of ingested Po-210 that lead to an acute lethal dose (assumed to be 10 Sv) are between **10 and 200 MBq (0.06 to 1.2 µg)**, depending on the time in which the lethal dose is reached.

**0.06 µg** give a dose of 10 Sv after around **100 Days**

**1.20 µg** give a dose of 10 Sv after around **3 Days**

The picture shows 0.01 g

**0.0000012 g** is the lethal dose within 3 days



# Deployment 08-22.12.2006

Due to the death of the ex-KGB agent Litvinienko in November 2006 in London.



1<sup>st</sup> Nov 2006:

Litvinenko met **two Russians** in the **Millenium Hotel** in London. At 3 pm he met the Italian security expert **Scaramella** at the **Iitsu Sushi Bar**.

23<sup>rd</sup> Nov 2006:

Litvinenko died at 9.21 pm

# Deployment 08-22.12.2006



**28<sup>th</sup> Oct 2006:**

Kovtun flew with Areoflot from Moscow to Hamburg and was picked up from the airport with a BMW. He sat on the passenger-seat. He spent the night at a flat belonging to his ex-wife in the Erzbergerstraße.

**29<sup>th</sup> Oct 2006:**

Kovtun stayed over in Haselau in the parish of Pinneberg.

**30<sup>th</sup> Oct 2006:**

Kovtun had an appointment at the Immigration Office in Hamburg-Altona and signed some papers. He stayed over at a friend's flat in the Kieler Straße in Altona.

**31<sup>st</sup> Oct 2006:**

Kovtun travelled around Hamburg and then stayed over in the Erzbergerstraße.

**1<sup>st</sup> Nov 2006:**

Kovtun travelled by taxi to Hamburg Airport and flew with Germanwings to London.

# Questions and Problems

- o Is Po-210 present at the sites visited by Kovtun?
- o If so, how much?
- o What measures have to be taken?
- The ZUB was called on by the City of Hamburg to carry out the deployment

# Tasks of the BfS from 08 - 22.12.2006

- I. Measurements at different scenes in Hamburg, Schleswig-Holstein and Cologne (detective work; clues) **Erzberger Straße, Kieler Straße, Haselau, airport, shops, restaurants**
- II. Laboratory analysis in Munich **Air filter samples, Every-day objects**
- III. Laboratory analysis in Munich / Berlin / Rossendorf **Urine samples**
- IV. Evaluation of the measurement results
- V. Advice for the public and deployed forces

# Confirming that Po-210 was present



Testing the  $\alpha$  detector before driving to the site

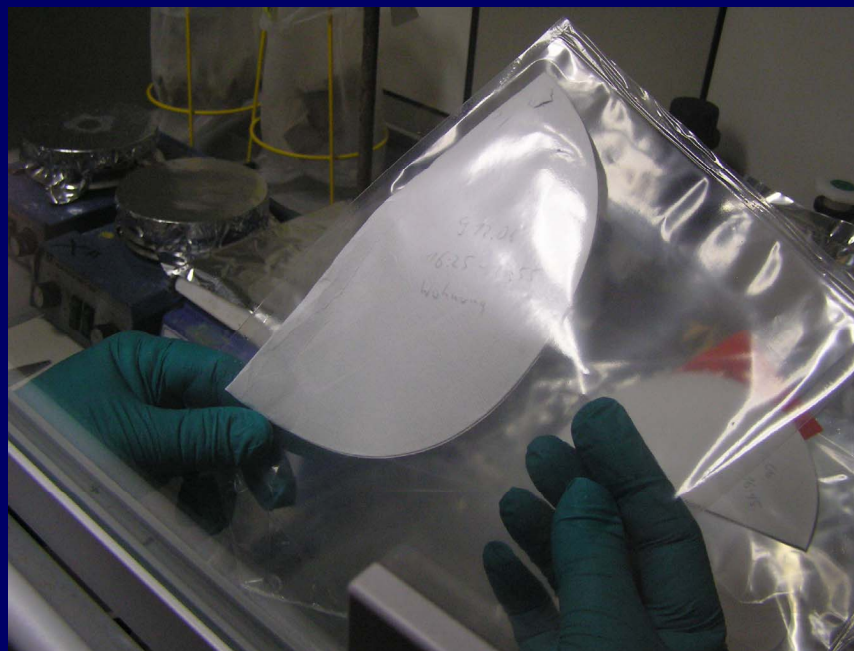
# Measuring for air contamination



Air filter samples were taken  
on the 9th December:

*In the stairway of Erzberger Str*  
*150 m<sup>3</sup> and 50 m<sup>3</sup>*

*In the ex-wife's house*  
*150 m<sup>3</sup> and 50 m<sup>3</sup>*



The air filter samples with a sampled air volume of 150 m<sup>3</sup> were flown to the BfS laboratory in Munich.

The measurements were ready on the 10th December and showed no elevated  $\alpha$ -activity in the air in the buildings.

# Measuring for $\alpha$ -contamination



German legal limit Po-210

1 Bq / cm<sup>2</sup>

Efficiency

10 %

Detector area

100 cm<sup>2</sup>

⇒ **10 counts/second**

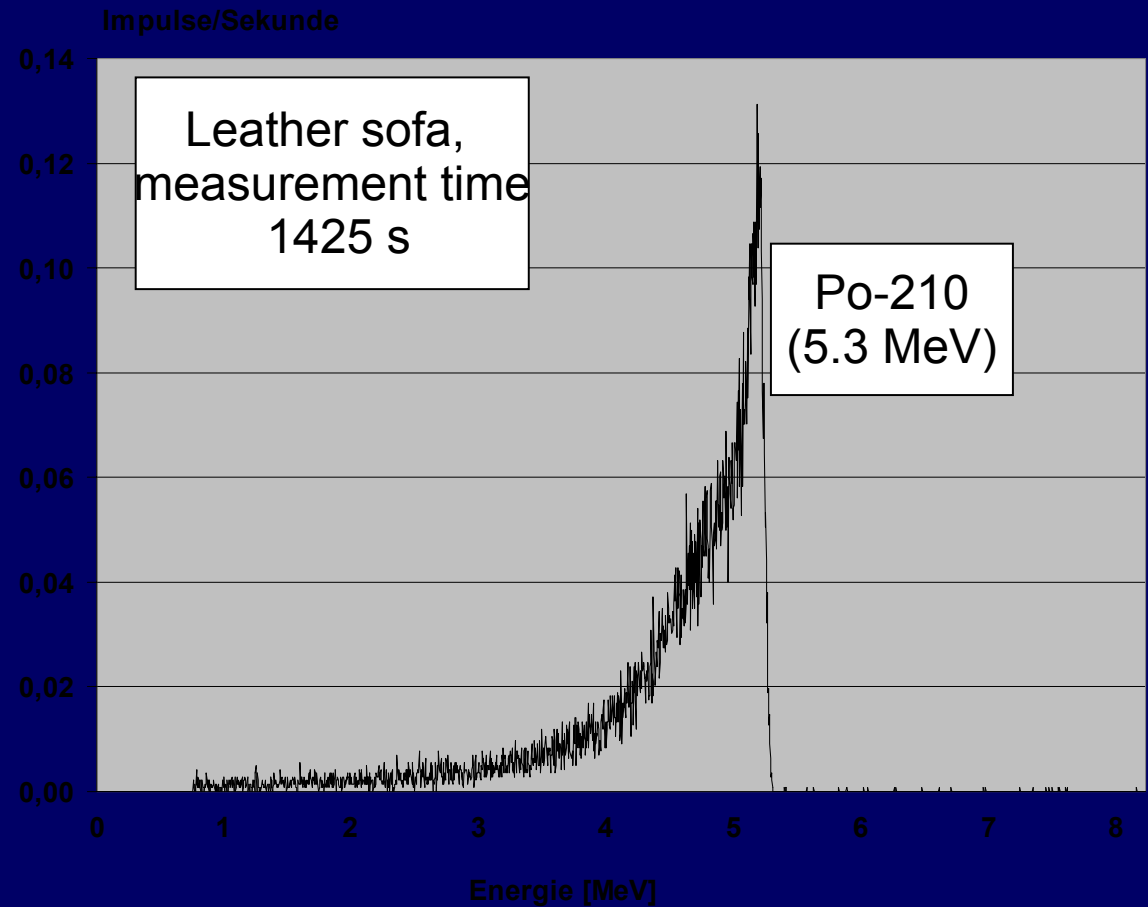
# Fabric samples

Seat of the leather sofa  
10.0 – 15.0 counts/second



**Po-210 :  $0.23 \pm 0.060$  Bq/cm<sup>2</sup>**

Pb-210 < 0.0073 Bq/cm<sup>2</sup> (γ-spectroscopy)



# Fabric samples

Head-rest from the family car  
9.0 counts/second



**Po-210:  $3.1 \pm 0.7$  Bq/cm<sup>2</sup>**  
**(Grid ionisation chamber)**

**$4.4 \pm 1.1$  Bq/cm<sup>2</sup>**  
**(Radiochemistry)**

**Pb-210:  $< 0.0024$  Bq/cm<sup>2</sup> ( $\gamma$ -spectroscopy)**

# INCORPORATION – URINE SAMPLES

59 urine samples were collected from 53 people.

The median activity in uncontaminated urine was 3.5 mBq/d.

<u>Group tested</u>	<u>24h-activity (mBq/d)</u>	<u>Dose (mSv)</u>
Toddler (urine from nappy)	106.0 / 156.0	0.84 / 1.25
Family of ex-wife	20.0 ± 4.8	0.03 ± 0.02
Special unit forces	4.4 ± 3.8	0.005 ± 0.004

# Thank you for your attention

## Questions?

**E. A. Kroeger, Federal Office for Radiation Protection,  
ITU Advanced Training Course with Nucleonica, April 2009**